STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

DOCKET NO. 2019-184-E

In the Matter of: South Carolina Energy Freedom Act (H.3659) Proceeding to Establish Dominion Energy South Carolina's Standard Offer, Avoided Cost Methodologies, Form Contract Power Purchase Agreements, Commitment to Sell Forms, and Any Other Terms or Conditions Necessary (Includes Small Power Producers as Defined in 16 United States Code 796, as Amended) - S.C. Code Ann. Section 58-41-20(A),	**PARTIAL PROPOSED ORDER OF THE SOUTHERN ALLIANCE FOR CLEAN ENERGY AND SOUTH CAROLINA COASTAL CONSERVATION LEAGUE**

I. INTRODUCTION

This matter comes before the Public Service Commission of South Carolina ("Commission") pursuant to the provisions of Section 210 of the Public Utility Regulatory Policies Act of 1978 ("PURPA"), 18 U.S.C. § 824a-3, and the Federal Energy Regulatory Commission ("FERC") regulations implementing those provisions, which delegated to this Commission certain responsibilities for determining each utility's avoided costs with respect to rates for purchase from qualified cogenerators and small power production facilities. These proceedings are also held pursuant to S.C. Code Ann. § 58-41-20(A) of the Energy Freedom Act ("Act 62" or "EFA").

Dominion Energy South Carolina ("DESC" or "the Company") filed initial testimony on August 23, 2019 seeking Commission approval of the Companies' proposed standard offer avoided cost methodologies, form contract power purchase agreements, and commitment to sell forms.

The South Carolina Solar Business Alliance, LLC ("SBA"), Johnson Development Associates, Inc. ("JDA"), the Southern Alliance for Clean Energy ("SACE") and South Carolina Coastal Conservation League ("CCL"), Ecoplexus, Inc. ("Ecoplexus"), the South Carolina Energy Users Committee ("SCEUC"), and Walmart, Inc. ("Walmart") intervened. The South Carolina Office of Regulatory Staff ("ORS") is automatically a party pursuant to S.C. Code Ann. § 58-4-10(B) (2015).

Pursuant to S.C. Code Ann. § 58-41-20(I), the Commission retained Power Advisory, LLC ("Power Advisory") as its qualified, independent third party consultant.

II. STATUTORY STANDARDS

A. PURPA

Section 210 of PURPA and the regulations promulgated pursuant thereto by FERC establish the responsibilities of FERC and state regulatory authorities to encourage the development of cogeneration and small power production facilities. Section 210 of PURPA requires FERC to prescribe such rules as it determines necessary to encourage cogeneration and small power production, including rules requiring the purchase and sale of electric power by electric utilities to cogeneration and small power production facilities. Under Section 210 of PURPA, cogeneration facilities and small power production facilities that meet certain standards can become "qualifying facilities"

("QFs"), and thus become eligible for the rates and exemptions established in accordance with Section 210 of PURPA. 16 U.S.C. § 824a-3(d).

Each utility is required under Section 210 of PURPA to purchase available electric energy from cogeneration and small power production facilities that obtain QF status. *Id.* § 824a-3(a). For such purchases, electric utilities are required to pay rates that are just and reasonable to the ratepayers of the utility, are in the public interest, and do not discriminate against cogenerators or small power producers. *Id.* § 824a-3(b). FERC regulations require that the rates electric utilities pay to purchase electric energy and capacity from qualifying cogenerators and small power producers reflect the cost that the purchasing utility can avoid as a result of obtaining energy and capacity from these sources, rather than generating an equivalent amount of energy itself or purchasing the energy or capacity from other suppliers.

With respect to electric utilities subject to state jurisdiction, FERC delegated the implementation of these rules to state regulatory authorities. State commissions may implement these rules by the issuance of regulations, on a case-by-case basis, or by any other means reasonably designated to give effect to FERC's rules. However, in evaluating the evidence before it in this proceeding, the Commission is bound to comply with PURPA's minimum requirements. *E.g.*, 18 C.F.R. § 292.303(a) (requiring utility to purchase "any energy and capacity made available from qualifying facility"); 18 C.F.R. 292.304(e)(2) (utility must pay for "daily and seasonal" capacity value); 16 U.S.C. § 824a-3(b); 18 C.F.R. § 292.304(a)(1) (rates "shall not discriminate" against QFs).

The Commission must also remain mindful of PURPA's overall aims, and the pro-consumer, competitive effects that it enables. *See Kamine/Besicorp Allegany L.P.*,

908 F. Supp. 1180, 1192 (W.D.N.Y. 1995) ("effect of PURPA is to *introduce new energy producers into the marketplace*" and stating that if "traditional utilities were successful in excluding [QFs]," that could "reduce *competition*") (emphasis added); *In re Renewable Energy Certificates*, 389 N.J. Super. 481, 486 (N.J. Super. Ct. App. Div. 2007) ("Congress enacted the Public Utility Regulatory Policies Act of 1978 . . . *to increase competition* in the production of electricity and reliance on renewable energy.") (emphasis added); *State ex rel. Sandel v. New Mexico Public Utility Com'n*, 127 N.M. 272, 275, 980 P.2d 55, 58 (N.M. 1999) ("*Congress introduced competition* into the generation component of the electric power industry by enacting the Public Utility Regulatory Policies Act of 1978.") (emphasis added). As the U.S. Supreme Court has recognized, "Section 210 of PURPA was designed to encourage the development of cogeneration and small power production facilities" *American Paper Inst. v. Am. Elec. Power Serv. Corp.*, 461 US 402, 405 (1983). In enacting PURPA, "Congress believed that increased use [renewable energy] would reduce the demand for traditional fossil fuels" and it recognized that electric utilities have traditionally been "*reluctant* to purchase power from, and to sell power to, the nontraditional facilities." *FERC v. Mississippi*, 456 U.S. 742, 750 (1982) (emphasis added).

B. SOUTH CAROLINA ENERGY FREEDOM ACT

This proceeding further follows the mandates of the EFA, also designed to encourage renewable energy and independent power production. The EFA requires that at least once every twenty-four months, the commission approve each electrical utility's standard offer, avoided cost methodologies, form contract power purchase agreements, commitment to sell forms, and any other terms or conditions necessary to implement the

EFA. S.C. Code Ann. § 58-41-20(A). The EFA provides that any decision by the commission:

> shall be just and reasonable to the ratepayers of the electrical utility, in the public interest, consistent with PURPA and the Federal Energy Regulatory Commission's implementing regulations and order, and nondiscriminatory to small power producers; and shall strive to reduce the risk placed on the using and consuming public.

Id. The EFA further requires that in these proceedings, "the commission shall treat small power producers on a fair and equal footing with electrical utility-owned resources" by ensuring that "rates for the purchase of energy and capacity *fully and accurately* reflect the electrical utility's avoided costs" *Id.* § 58-41-20(B) (1) (emphasis added). The Act directs that power purchase agreements, including terms and conditions, "are commercially reasonable" and consistent with PURPA, and that each electrical utility's avoided cost methodology "fairly accounts" for costs avoided or incurred "including, but not limited to energy, capacity, and ancillary services" for small power producers, including "those utilizing energy storage equipment." *Id.* (B)(2),(3).

Act 62 requires Commission decisions in avoided cost dockets to be consistent with PURPA, ***and the Federal Energy Regulatory Commission's implementing regulations and orders***. S.C. Code Ann. § 58-41-20(A). Relevant for this proceeding, FERC Order 69 implementing PURPA explains that the difference in revenue requirements ("DRR") method, which DESC relies upon to calculate its avoided costs, requires use of an "optimal capacity expansion plan."[1] The DRR method:

> [C]alculate[s] the total (capacity and energy) costs that would be incurred by a utility to meet a specified demand in comparison to the cost that the utility would incur if it purchased energy or capacity or both from a qualifying facility to meet part of its demand, and supplied its remaining

[1] 45 Fed. Reg. at 12,216 (emphasis added).

> needs from its own facilities. The difference between these two figures would represent the utility's net avoided cost. In this case, the avoided costs are the excess of the total capacity and energy cost of the system ***developed in accordance with the utility's optimal capacity expansion plan***.[2]

The FERC order goes on to specify that "An optimal capacity expansion plan is the schedule for the addition of new generating and transmission facilities which, based on an examination of capital, fuel, operating and maintenance costs, will meet a utility's projected load requirements at the ***lowest total cost***."[3]

The EFA also directs the Commission to "engage, for each utility, a qualified independent third party to submit a report that includes the third party's independently derived conclusions as to that third party's opinion of each utility's calculation of avoided costs for purposes of proceedings conducted pursuant to this section." S.C. Code Ann. § 58-41-20(I). The Commission retained Power Advisory, LLC, as its independent third party consultant pursuant to the EFA.

C. STANDARD OF REVIEW

Pursuant to South Carolina law, the Commission has a duty to fully document its findings and base its decisions on reliable, probative, and substantial evidence on the whole record. *Porter v. South Carolina Public Service Com'n*, 333 S.C. 12, 21, 507 S.E.2d 328, 332 (1998). The Commission must make findings which are "sufficiently detailed to enable [a] court to determine whether those findings are supported by the evidence and whether the law has been applied properly to those findings." *Id.* Where

[2] *Id.*
[3] *Id.* at 12,216 n.6 (emphasis added).

material facts are in dispute, the Commission must make "specific, express findings of fact." *Id.*

Avoided cost payments are ultimately recovered through fuel cost riders, therefore this Commission "shall disallow" any costs that result from "any decision of the utility" resulting in unreasonable costs, with "due regard" given to "*minimization of the total cost of providing service*" among other factors. S.C. Code Ann. § 58-27-865(f) (emphasis added). Further, where non-utility parties make a showing that raises the specter of imprudence presumptive as to the reasonableness of a utility's proposed rate, the utility bears the burden of production and ultimately of persuasion to further substantiate its position. *See Utility Services of South Carolina, Inc. v SC Office of Reg. Staff*, 708 S.E.2d 755, 398 S.C. 96, 110 (2011).

In the present case, the utility contends that it proposed avoided cost rates and QF terms are accurate, just and reasonable, and that any departure from those derived rates would be improper. The non-utility parties, by contrast, have challenged the utility's proposed avoided cost rates for the purchase of energy and capacity because those rates and terms do not put "small power producers on a fair and equal footing with electrical utility-owned resources" and fail to "*fully and accurately* reflect the electrical utility's avoided costs." *Id.* § 58-41-20(B) (1). They further produced evidence and analysis to support their position that the proposed avoided cost rates, by assuming and incorporating costly measures to "integrate" solar generation, unfairly discriminate against QF's and artificially raise the cost of electrical service rather than the "minimization of the total cost of providing service," S.C. Code 58-27-865(f).

III. HEARING

The Commission convened a hearing on this matter on October 14 and 15, 2019 with the Honorable Comer H. Randall, Chairman, presiding. DESC was represented by K. Chad Burgess, Esquire, Matthew W. Gissendanner, Esquire, Belton T. Zeigler, Esquire, and Mitchell Willoughby, Esquire. SCEUC was represented by Scott Elliot, Esquire. SBA and JDA were represented by Weston Adams, II, Esquire, and Jeremy C. Hodges, Esquire. SBA and Ecoplexus were represented by Richard L. Whitt, Esquire. JDA was represented by James H. Goldin, Esquire. CCL and SACE were represented by J. Blanding Holman, IV, Esquire, Stinson Woodward Ferguson, Esquire, and Lauren Joy Bowen, Esquire. Walmart was represented by Carrie Harris Grundmann, Esquire. Jeffrey M. Nelson, Esquire, Nanette S. Edwards, Esquire, and Jenny R. Pittman, Esquire, represented ORS. In this Order, DESC, ORS, SCEUC, SBA, JDA, Ecoplexus, SACE, CCL, and Walmart are collectively referred to as the "Parties" or sometimes individually as a "Party."

Through their personal appearances, DESC presented the consolidated direct and rebuttal testimonies and exhibits of John H. Raftery, Daniel F. Kassis, Eric H. Bell, Matthew W. Tanner, Joseph M. Lynch, James W. Neely, and Alan W. Rooks, and the rebuttal testimony of Thomas E. Hanzlik.[4] Through their personal appearances, SBA presented the consolidated direct and surrebuttal testimony and exhibits of Steven J. Levitas and JDA presented the consolidated direct and surrebuttal testimony of Rebecca

[4] Prior to the hearing and without objection from the remaining parties, the Commission granted DESC, JDA, and SBA permission to utilize panels for the presentation of witnesses. DESC Witnesses Kassis and Raferty presented as the first panel for the Company; Witnesses Hanzlik and Bell presented as the second panel; and Witnesses Neely, Tanner, and Lynch presented as the third panel.

Chilton.[5] Through their personal appearances, SBA presented the consolidated direct and surrebuttal testimony and exhibits of Edward A. Burgess Hamilton Davis, and Jon Downey.[6] Through his personal appearance, SACE and CCL presented the consolidated direct and surrebuttal testimony and exhibits of Derek P. Stenclik. Through their personal appearances ORS presented the consolidated direct and surrebuttal testimony and exhibits of Brian Horii and Robert A. Lawyer. SCEUC, Ecoplexus, and Walmart did not present witnesses at the hearing.

IV. REVIEW OF EVIDENCE AND EVIDENTIARY CONCLUSIONS

The Commission has a duty to fully document its findings and base its decisions on reliable, probative, and substantial evidence on the whole record. *Porter v. South Carolina Public Service Com'n*, 333 S.C. at 21, 507 S.E.2d at 332. Accordingly, in this matter the Commission exercises a searching review of the utility's proposed avoided cost rates, with an eye towards furthering the goals of the EFA and PURPA and in a manner that "fully and accurately" reflects avoided costs while minimizing risk to ratepayers and total costs of service.

After hearing the evidence and testimony of the witnesses, summarized below, the Commission reaches its factual and legal conclusions:

A. DESC'S PROPOSED VARIABLE INTEGRATION CHARGE

1. DESC Direct Testimony

[5] JDA Witness Chilton and SBA Witness Levitas presented as a panel.
[6] SBA Witnesses Downey, Davis and Witness Burgess presented as a panel.

DESC Witness Kassis introduced the Company's proposed Variable Integration Charge ("VIC") and Embedded Integration Charge ("EIC").[7] Witness Kassis testified that DESC had previously maintained a provision in its Power Purchase Agreement ("PPA") that allowed a VIC to be implemented, but that the Proposed Form PPA currently does not include a VIC.[8] Witness Kassis asserted that DESC was required to maintain higher operating reserves due to the addition of variable solar generation on the Company's system, and that the higher operating reserves and associated costs were part of DESC's normal dispatch, and therefore more appropriately addressed in the avoided cost methodology.[9] Therefore, the Company removed the VIC clause from the Company's Proposed Form PPA, and instead factored the EIC into the proposed avoided energy costs in this proceeding. Pursuant to the Company's proposal, future QFs would pay for variable integration costs through the EIC included in avoided energy costs, while QFs with fully executed PPAs which include a VIC provision will be prospectively charged a VIC of $4.14/MWh, in accordance with the calculations of DESC Witness Tanner.[10]

DESC Witness Bell discussed the data which the Company provided to Navigant Consulting, Inc. ("Navigant") in connection with the *Cost of Variable Integration Study* ("*the Study*") sponsored by DESC Witness Tanner and used to support the proposed VIC imposed on existing QFs.[11] Witness Bell asserted that as more solar generation has come onto DESC's system, variability has increased, and DESC must make operational

[7] Tr. Vol. 1, p. 59.14, ll. 1-13. Witness Kassis adopted DESC Witness John E. Folsom, Jr.'s prefiled testimony. Tr. Vol. 1, p. 66.3, l.10-15
[8] Tr. Vol. 1, p. 59.14, ll. 2-4.
[9] Tr. Vol. 1, p. 59.14, ll. 6-13.
[10] Tr. Vol. 1, p. 59.15, l. 9 – p. 59.16, l. 15.
[11] Tr. Vol. 1, p. 167.2, l. 17 – p. 167.3, l. 2.

adjustments to follow the energy generated by solar facilities and maintain sufficient reserve generations capability to meet system reliability requirements.[12] Witness Bell stated that solar generation would eventually exceed DESC's ability to provide adequate reserves unless the Company maintains more hourly operating reserves or adds more quick start resources to its system.[13] Witness Bell also asserted that while the Company forecasts the expected amount of solar generation, projections of anticipated solar generation are less reliable than those of other generating resources such as natural gas or coal-fired generation facilities.[14] Therefore, Witness Bell stated, the utility must be ready for the unexpected loss of solar generation well ahead of a contingency, which requires generators to be available or online that are capable of quickly and reliably producing electricity in the event of a shortfall.[15] Witness Bell asserted that the Navigant study used of the PROMOD® modeling software reasonably reflects the actual operating characteristics of DESC's system.[16]

Witness Bell described the data that the Company had provided to Navigant in order for Navigant to evaluate the operational and financial impact of growing solar generation.[17] He discussed the Navigant *Study's* case studies, which simulated various amounts of solar generation on DESC's system.[18] Witness Bell explained that the *Study's* base case included the first tranche of solar installations that do not contain a VIC clause, and the change case included the remaining signed PPAs that did not contain a

[12] Tr. Vol. 1, p. 167.12, ll. 10-12.
[13] Tr. Vol. 1, p. 167.12, ll. 15-17.
[14] Tr. Vol. 1, p. 167.12, ll. 4-9.
[15] Tr. Vol. 1, p. 167.13, l. 4 – p. 267.14, l. 18.
[16] Tr. Vol. 1, p. 167.22, ll. 7-8.
[17] Tr. Vol. 1, p. 167.16, l. 12 – p. 167.19, l. 5.
[18] Tr. Vol. 1, p. 167.19, ll. 8-16.

VIC clause.[19] Witness Bell stated that by comparing these two scenarios, the *Study* analyzed the impact of the actual amount of solar interconnected prior to 2018 separately from utility-scale solar expected to be interconnected by the end of 2020.[20]

DESC Witness Tanner discussed the background, findings, and conclusion of the *Cost of Variable Integration Study* that Navigant prepared on behalf of DESC.[21] According to Witness Tanner, the purpose of the *Study* was to estimate the impacts that solar installations have on DESC's system operations and to determine the resulting incremental costs for projects that are already under contract and have a VIC clause in their PPAs.[22] Witness Tanner summarized the key aspects of the *Study's* assumptions and methodology: (1) the PROMOD® production cost model was benchmarked to DESC's system information in order to provide a baseline for the analysis; (2) solar forecast uncertainty was estimated by comparing four-hour-ahead solar forecasts with actual solar generation from the National Renewable Energy Lab's ("NREL") solar integration dataset; (3) Navigant estimated the hours in which system operators would be unable to maintain the current required level of reserves if solar missed its forecast by the amount estimated in the previous step; (4) the level of additional reserves that DESC would need to maintain was calculated as the maximum amount per day that solar could under-produce compared to the forecasted amount; (5) the cost of maintaining the additional reserves calculated in the previous step was calculated.[23] Navigant then evaluated the effect of adding battery storage and gas combustion turbines to the system as alternative mitigation options, and considered the operating characteristics that would

[19] Tr. Vol.1, p. 167.20, ll. 16-19.
[20] Tr. Vol. 1, p. 167.20, ll. 19-22.
[21] Tr. Vol. 1, p. 290.3, ll. 17-21.
[22] Tr. Vol. 1, p. 290.5, l. 19 – p. 290.6, l. 2.
[23] Tr. Vol. 1, p. 290.12, l. 12 – p. 290.13, l. 19.

be necessary for a solar project to not increase DESC's reserve requirements.[24] Witness Tanner also summarized the *Study's* conclusions: (1) the solar generation being added to DESC's system is a variable resource that adds uncertainty to the generation needed from the rest of the system; (2) DESC needs to maintain additional operating reserves to ensure that load and current reserve obligations are met; (3) the levelized cost of maintaining additional operating reserves for the tranche of roughly 700 MW of solar generation that have a VIC clause in their PPAs is $4.14/MWh for the All Solar Case; (4) building additional resources such as battery storage or quick-start gas combustion turbines solely to provide reserves will not reduce costs to DESC due to the additional capital costs required for such facilities; (5) the installation of co-located batteries or charging operations to become more flexible could allow solar projects to be added to the system without increasing reserve requirements.[25]

2. SBA Direct Testimony

SBA Witness Burgess provided testimony evaluating DESC's proposed VIC. Witness Burgess explained that DESC had proposed two separate approaches for assessing integration costs of solar QFs, one for QFs with existing PPAs and the other for future QFs.[26] For solar QFs with VIC clauses in their PPA terms, integration costs would be assessed in the form of a new VIC. In contrast, future QFs, with no VIC clause in their PPA terms, would be assessed integration costs in the form of a substantially reduced avoided energy cost rate.[27] Witness Burgess explained that in support of the VIC for existing QFs, DESC commissioned the Navigant *Cost of Variable Integration Study*,

[24] Tr. Vol.1, p. 290.13, l. 20 – p. 290. 14, l. 4.
[25] Tr. Vol. 1, p. 290.11, ll. 6-22.
[26] Tr. Vol. 2, p. 523.62, ll. 12-13.
[27] Tr. Vol. 2, p. 523.62, l. 13 – p. 523.63, l. 2.

but that the charge applied to future QFs, which is incorporated into DESC's avoided energy rate ("Embedded Integration Charge" or "EIC") was the product of an internal DESC analysis the details of which were provided in response to an SBA data request only one day before direct testimony was due.[28] Witness Burgess expressed concerns regarding the VIC and EIC and the limited and flawed analyses underlying both charges.

Specifically, Witness Burgess testified that: (1) it was premature to impose any integration charges until the true cost of integration was more accurately quantified through independent analysis as contemplated by the EFA; (2) the analysis relied upon by DESC to support the proposed integration costs contained multiple fundamental methodological flaws that exaggerate the projected costs of integration services; (3) there is little evidence in South Carolina or other jurisdictions that the magnitude of integration costs predicted by DESC will materialize in the near future due to incremental solar deployment; (4) the proposal was incomplete in that it only considered integration costs imposed by solar QFs and failed to consider integration services that could be provided by solar QFs, as required by the EFA; and (5) the VIC is based on hypothetical assumptions that are divorced from real-world costs, and thereby introduces significant uncertainty that will harm QF projects.[29]

More specifically, Witness Burgess explained that the methodology used in the *Cost of Variable Integration Study* inaccurately modeled DESC as an islanded system; overestimated solar intermittency and forecast error and only partially accounted for the effects of geographic diversity; used an overly long 4-hour ahead forecast window that

[28] Tr. Vol. 2, p. 523.63, ll. 5-9.
[29] Tr. Vol. 2, p. 523.63, l. 12 – p. 523.64, l. 6.

artificially restricted unit commitment and dispatch decisions; and applied additional reserve requirements to 8,760 hours of the year, including during non-solar hours.[30]

Witness Burgess also critiqued DESC's internal analysis relating to the Embedded Integration Charge for future QFs. Witness Burgess explained that DESC's estimate that it would need additional reserves equal to 35% of installed solar capacity to address solar intermittency was not credible.[31] Specifically, Witness Burgess did not find reasonable DESC's assumption that a "drop" in solar production creates a corresponding need for reserves on a 1:1 basis given that DESC would often have excess reserves online.[32] Furthermore, DESC provided no data or analysis of its actual operating reserves and related costs over the time period that that solar "drops" were observed, making the Company's claim that the solar "drops" led to additional costs wholly unsupported.[33] Witness Burgess also described errors in modeling DESC as an island, scaling of solar volatility, using overly long solar forecasts, and adding reserves during hours when solar QFs are not generating—an error found in the Navigant *Study* that applies equally to DESC's analysis underlying the EIC.[34] Since DESC stated that the avoided energy rate for a solar QF would be $23.46/MWh if no additional integration costs were included and proposed an avoided energy cost rate of $16.76/MWh, Witness Burgess concluded that DESC's proposed EIC is at least $6.70/MWh—substantially higher than the VIC and integration costs proposed in other jurisdictions.[35] Given its lack of foundation, witness

[30] Tr. Vol. 2, p. 523.67, l. 3 – p. 523.79, l. 20.
[31] Tr. Vol. 2, p. 523.80, ll. 1-12.
[32] Tr. Vol. 2, p. 523.80, l. 15 – p. 523.81, l. 2.
[33] Tr. Vol. 2, p. 523.81, ll. 3-10.
[34] Tr. Vol. 2, p. 523.81, l. 11 – p. 523.82, l. 7.
[35] Tr. Vol. 2, p. 523.82, ll. 10-17.

Burgess recommended that the EIC be rejected and the Commission require DESC to adopt a technology-neutral approach to calculating avoided cost rates.[36]

Witness Burgess also noted that the un-capped, variable nature of the VIC and EIC would mean that project costs for QFs would increase substantially to account for the risk of an increasing charge.[37] Witness Burgess recommended that any future integration charge include a reasonable cap that limits the charge for projects of a similar vintage to a reasonable level.[38]

3. SACE and CCL Direct Testimony

SACE and CCL Witness Stenclik reviewed and provided testimony assessing DESC's proposed VIC. Witness Stenclik identified several methodological errors in the *Cost of Variable Integration Study* underlying the proposed VIC.[39]

First, Witness Stenclik explained, the *Study* assumed inappropriately high reserve requirements. The *Study* failed to accurately capture current operating practices; failed to account for aggregation benefits as solar generation grows; used an excessive 4-hour ahead forecast that led to forecast error being overstated; and used an overly stringent 99% confidence interval for the operating reserve methodology.[40] All of these factors contributed to overly stringent reserve requirements.

Second, the *Study* erroneously calculated the reserve requirements. The *Study* imposed additional fixed solar reserve requirement 8,760 hours a year, even when solar is not producing; failed to include significant additional reserve capability from the Fairfield Pumped Storage plant and from interruptible load that are appropriately

[36] Tr. Vol. 2, p. 523.83, ll. 3-7.
[37] Tr. Vol. 2, p. 523.92, ll. 3-7.
[38] Tr. Vol. 2, p. 523.92, ll. 9-10.
[39] Tr. Vol. 2, p. 629.5, l. 1 – p. 629.6, l. 23.
[40] Tr. Vol. 2, p. 629.5, ll. 5-16; Hearing Exhibit 12, pp. 3-12.

available as solar forecast error reserves; and did not properly account for neighboring power systems as an economic resource.[41]

Third, the *Study* failed to evaluate less costly method of integrating low-cost renewable resources. These could have included existing demand response; the full range of services that could be provided by new battery energy storage and CT units; or participation in a larger balancing area or implementation of new demand response, flexible solar, combined cycle upgrades, and discounting of solar forecasts.[42]

Fourth, Witness Stenclik explained, variable integration charges targeted at specific technologies are fundamentally flawed because each generation technology has advantages and limitations, and the system should be optimized to deliver least cost service to ratepayers overall rather than developing individual charges that are only applied to a subset of generation resources.[43]

Witness Stenclik stressed that solar variability and potential forecast errors at the levels evaluated by the *Study* do not pose actual reliability risks to DESC.[44] Witness Stenclik explained that DESC is a part of the Eastern Interconnection, which is large enough that even if DESC's solar generation disconnected simultaneously, there would be no reliability risk because there is sufficient inertia and response from other generators across the region to respond.[45] Instead, Witness Stenclik explained, solar variability and uncertainty may pose economic and coordination challenges. As a result DESC should consider modification to its coordination with neighboring balancing areas and reserve sharing groups and work to solve challenges associated with integrating solar

[41] Tr. Vol. 2, p. 629.5, l. 17 – p. 629.6, l. 7; Hearing Exhibit 12, pp. 12-21.
[42] Tr. Vol. 2, p. 629.6, l. 8-17; Hearing Exhibit 12, pp. 22-26.
[43] Tr. Vol. 2, p. 629.6, ll. 18-23; Hearing Exhibit 12, p. 26.
[44] Tr. Vol. 2, p. 629.8, ll. 4-19.
[45] Tr. Vol. 2, p. 629.8, ll. 4-8.

collectively.[46] Witness Stenclik also explained that other jurisdictions such as Texas and California have successfully integrated large amounts of variable renewable energy without increasing operating reserves to cover variability or forecast errors of solar generation.[47]

Witness Stenclik recommended that the Commission require DESC to file an updated analysis that addresses intervenors' concerns, implements new modeling tools and updated methodologies, and adopts industry recognized practices related to reserves and variable renewable integration studies.[48] Witness Stenclik also recommended that DESC utilize a Technical Review Committee ("TRC") composed of outside experts on variable renewable integration in order to guide future integration studies.[49]

4. ORS Direct Testimony

ORS Witness Horii testified that assumptions made by Navigant in the *Cost of Variable Integration Study* overstated the risk of uncertain variable generation which resulted in inflated variable integration costs.[50] Witness Horii found that the *Study* included multiple erroneous methods and assumptions, including: (1) failure to conduct an analysis that balances risks and costs to determine the additional amount of operating reserves that need to be carried due to the existence of variable solar resources on the system; (2) an unreasonable degree of risk-aversion in determining the amount of additional operating reserves due to potential solar forecast error; and (3) an unnecessary

[46] Tr. Vol. 2, p. 629.8, ll. 9-13. DESC filed a letter with the Commission on October 30 stating that Southern Company was not interested in joining the VACAR-Reserve Sharing Group. But this appears to be the limit of the Company's inquiry to date regarding potentially expanding its reserve sharing and coordination capabilities with neighboring utilities.
[47] Tr. Vol. 2, p. 629.9, ll. 4-12.
[48] Tr. Vol. 2, p. 629.7, ll. 4-9.
[49] Tr. Vol. 2, p. 629.7, ll. 9-13.
[50] Tr. Vol. 2, p. 695.10, ll. 3-22.

holding of operating reserves level constant over each day.[51] Specifically, Witness Horii critiqued the *Study's* use of maximum drop in output from the aggregate solar fleet as the solar forecast error. Witness Horii testified that this approach is inaccurate because it does not reflect the actual distribution of likely solar output or the possibility that customer demand may be lower than expected, which would lower the need for additional reserves.[52] Witness Horii proposed an alternative calculation of the risk of solar output error that used a more balanced approach that resulted in a 36.2% reduction in integration costs, which would bring the VIC to $2.29.[53]

Witness Horii also critiqued DESC's methodology for calculating the amount of additional operating reserves needed to accommodate the integration of solar resources as included in the Company's proposed avoided energy cost rates.[54] Witness Horii testified that DESC decision to model avoided energy cost calculations with additional operating reserves equal to 35% of the installed solar capacity on DESC's electrical system was unreasonable.[55] This is because DESC derived the 35% value by looking at observed drops in solar outputs over a single 1-hour period; if solar output was analyzed over a shorter amount of time, the amount of solar drops would be far less, and the need for additional reserves would less as well (between 13% to 18%) to maintain the same certainty level.[56] Witness Horii explained that operating reserves generally must be on-line and synchronized with the grid so that they can be fully generating power within ten minutes, while cheaper non-spinning or supplemental reserves can be used to meet

[51] Tr. Vol. 2, p. 695.11, ll. 3-11.; p. 695.13, ll. 3-14.
[52] Tr. Vol. 2, p. 695.13, ll. 7-14.
[53] Tr. Vol. 2, p. 695.13, l. 22 – p. 695.19, l. 5.
[54] Tr. Vol. 2, p. 695.27, l. 10 – p. 695.28, l. 695.31.
[55] Tr. Vol. 2, p. 695.28, l. 4 – p. 695.29, l. 4.
[56] Tr. Vol. 2, p. 695.28, ll. 8-17.

ramping needs over longer timeframes such as an hour. Witness Horii concluded that by setting high operating reserves and meeting them with an expensive fast-responding option to address a slow 1-hour problem, DESC overestimated the costs of solar integration.[57]

Witness Horii identified several additional flaws in the calculation method used by DESC. For example, Witness Horii testified that data obtained from the Company concerning annual operating costs with higher solar operating reserve requirements actually show that costs alternate between positive and negative values (i.e., cost savings).[58] This inconsistency led Witness Horii to question the validity and accuracy of DESC's method and model for calculating the impact of the operating reserve levels on operating costs.

Witness Horii recommended that avoided energy costs should not be adjusted to account for additional operating costs for solar projects. Instead, he recommended that avoided energy costs be estimated based on the normal operating reserve level for both the base case and the solar change case.[59] Witness Horii proposed alternative avoided energy rates by removing the effect of the higher operating reserve levels from DESC's solar change case, which resulted in higher avoided energy cost rates that DESC's original proposal.[60]

5. DESC Rebuttal Testimony

In his rebuttal testimony, DESC Witness Bell responded to ORS Witness Horii, SBA Witness Burgess, and SACE and CCL Witness Stenclik's critiques of the

[57] Tr. Vol. 2, p. 695.29, l. 18 – p. 695.28, l. 4.
[58] Tr. Vol. 2, p. 695.29, l. 16 – p. 695.30, l. 3.
[59] Tr. Vol. 2, p. 695.30, ll. 6-9.
[60] Tr. Vol. 2, p. 695.30, l. 14 – p. 695.31, l. 3.

Company's proposed variable integration charges. Witness Bell asserted that Witness Horii's concern that the *Cost of Variable Integration Study* overstated reserve needs by holding reserve levels constant throughout each day of the year was not reasonable because Navigant recognized and addressed this issue by adjusting the VIC to adjust for the different between constant reserves and lesser amounts needed on 62% of the days modeled.[61] Witness Bell asserted that Witness Horii's recommendation that DESC use solar drops over a shorter timeframe than 15 minutes was too short a period to assess the impact of solar intermittency on the operations and economics of the electrical generating system.[62]

Witness Bell also disagreed with Witness Stenclik's testimony that the *Cost of Variable Integration Study* did not accurately capture current operating practices, and argued that DESC's actual operating practice requires additional reserves of 40% of actual output for solar intermittency, greater than the 35% value used in DESC's internal avoided cost studies and in line with the Navigant *Study's* 4-hour drop probability table.[63] In response to Witness Stenclik's concern that the *Study* imposed additional fixed solar reserve requirements for each hour of the year rather than as a function of hourly forecast solar generation, Witness Bell stated that DESC has been using and will continue to use forecasted solar production and actual solar production to plan and maintain reserves on an hourly basis for real-time system operations, but did not state that this reality was reflected in the *Study*.[64] Witness Bell also disagreed with Witness Stenclik's statement that solar volatility created a financial and operational challenge rather than a reliability

[61] Tr. Vol. 1, p. 176.2, l. 15 – p. 176.3, l. 9.
[62] Tr. Vol. 1, p. 176.6, ll. 10 -21.
[63] Tr. Vol. 1, p. 176.7, ll. 12-16.
[64] Tr. Vol. 1, p. 176.10, ll. 10-12.

risk, asserting that it would be irresponsible for DESC to "simply ride the tie lines on the Eastern Interconnection" in the event of a sudden large-scale loss of solar generation.[65]

Witness Bell also disagreed with Witness Burgess's testimony that a variable integration charge should not be established until an independent integration study has been performed pursuant to the EFA.[66] Witness Bell stated that the DESC is already experiencing the effects of increased solar capacity on its system and that customers are currently paying additional costs, which should be recovered from solar providers at the earliest possible opportunity.[67] Witness Bell suggested that the integration study contemplated in the EFA was forward looking and that because the VIC would only apply to QFs with existing PPAs, it would not be appropriate to delay imposing a charge until an independent study is conducted.[68]

In his rebuttal testimony DESC Witness Hanzlik also responded to intervenors' critiques of the Navigant *Study* and DESC's avoided energy cost calculations. Witness Hanzlik asserted that, contrary to Witness Stenclik's testimony, the *Cost of Variable Integration Study* does accurately capture DESC's current operating practices. Witness Hanzlik relied on a graph of system load and solar generation on one day in 2019 to demonstrate how and why DESC must maintain operating reserves for solar generation and why this need increases as solar capacity increases.[69] Witness Hanzlik also disagreed with Witness Stenclik's assertion that even if all the DESC's solar generation simultaneously disconnected there would be no reliability risk because there is sufficient inertia and response from other generators across the region to respond. Witness Hanzlik

[65] Tr. Vol. 1, p. 176.11, l. 12 – p. 176. 12, l. 18.
[66] Tr. Vol. 1, p. 176.14, ll. 6-18.
[67] Tr. Vol. 1, p. 176.14, ll. 9-10.
[68] Tr. Vol. 1, p. 176.14, ll. 13-18.
[69] Tr. Vol. 1, p. 188.9, l. 3 – p. 188.10, l. 10.

asserted that in order to conform to NERC's BAL-002 standard, DESC would have to deploy its operating reserves to restore its Area Control Error ("ACE") to zero within fifteen minutes, and would not have access to generation under its reserve sharing agreements to address loss of solar generation due to inherent intermittency of the resource.[70] Witness Hanzlik also responded to Witness Stenclik's testimony that the *Cost of Variable Integration Study* failed to include significant additional reserve capacity from the Fairfield Storage Plant, stating that the Plant was already dispatched optimally and that committing it for reserve capability would require more expensive generation to be dispatched to meet system needs.[71] Witness Hanzlik also testified that the 35% of operating reserves that the Company's avoided cost rates are based on was not sufficient for reliability, and that System Control considers 60% of forecasted solar across the peak hour as reliable power and considers 40% to be a risk.[72] Therefore, Witness Hanzlik stated that the 35% figure in the currently proposed avoided cost rates would likely increase as solar generation increases within DESC's territory.[73]

In his rebuttal testimony, DESC Witness Tanner responded to ORS Witness Horii, SACE and CCL Witness Stenclik, and SBA Witness Burgess's direct testimonies.[74] Witness Tanner disagreed with Witness Horii's statement that the assumptions underlying the *Cost of Variable Integration Study* overstate the risks of variable generation to the Company.[75] Witness Tanner also disagreed with Witness Horii's testimony that DESC failed to conduct an analysis that balances risks and costs to

[70] Tr. Vol. 1, p. 188.13, l. 19 – p. 188.14, l. 5.
[71] Tr. Vol. 1, p. 188.16, ll. 1-8.
[72] Tr. Vol. 1, p. 188.21, ll. 8-12.
[73] Tr. Vol. 1, p. 188.2, l. 12-14.
[74] Tr. Vol. 1, p. 300.1, l. 10 – 300.2, l. 2.
[75] Tr. Vol. 1, p. 300.2, ll.15-18.

determine the amount of operating reserves needed, arguing that the 1% risk threshold used by the study fairly balanced risk reduction versus the cost of holding additional reserves.[76] Witness Tanner opposed Witness Horii's suggestion that a 2% threshold for solar undergeneration be used instead of the 1% threshold used in the *Study*,[77] and argued that adopting Witness Horii's alternative VIC calculation would result in too much risk to reliability for DESC and its customers.[78]

Witness Tanner also disagreed with SACE and CCL Witness Stenclik's testimony that the *Study* incorrectly analyzed solar data and therefore overstated reserve requirements, asserting that Navigant worked to avoid overstating the reserve requirements and made sure to fully include geographic diversity of solar generation in the *Study's* analysis.[79] Witness Tanner also opposed Witness Stenclik's suggestion that since the *Study* used a four hour forecast error, offline combined cycle units should be allowed to provide reserves; Tanner asserted that the turning on of combined cycle units in response to additional reserve requirements is one of the potential drivers of system cost increases in the *Study*.[80] Witness Tanner also disagreed with Witness Stenclik's recommendation that *Study* more accurately model the full capabilities of the Fairfield Pumped Storage plant, arguing that the model already configured the Fairfield Station to provide flexible reserves, and that relying on interruptible load to meet daily operating requirements would increase customer costs.[81] Witness Tanner also contested Witness Stenclik's testimony that the *Study* failed to adequately evaluate less costly methods of

[76] Tr. Vol. 1, p. 300.3, ll. 15-21.
[77] Tr. Vol. 1, p. 300.4, ll. 6-20.
[78] Tr. Vol. 1, p. 300.4, ll. 6-10.
[79] Tr. Vol. 1, p. 300.9, ll. 6-12.
[80] Tr. Vol. 1, p. 300.9, l. 20 – p. 300.10, l. 3.
[81] Tr. Vol 1, p. 300.10, l. 21 – p. 300.11, l. 10.

integrating renewable resources, stating that the *Study* looked at the costs for DESC to add a gas-fired peaking facility or storage to the system to provide flexible reserves for renewable integration, and that both these options were excluded as too expensive.[82] Witness Tanner also disagreed with Witness Stenclik's testimony that other jurisdictions have successfully integrated variable renewable energy without a significant increase in reserve requirements, and argued that while renewable generation has not been observed to impact the need for regulating reserves, they do increase the need for flexible reserves.[83]

Witness Tanner also responded to SBA Witness Burgess's direct testimony. Witness Tanner disagreed with Witness Burgess's testimony critiquing the *Study* modeling of DESC as a partially islanded system, and asserted that while the Company does trade with surrounding systems, this activity is generally for economic opportunity and does not have a reliability component.[84] Witness Tanner also contested Witness Burgess's statement that the *Study* failed to properly consider geographic diversity, arguing that the *Study* did consider geographic diversity benefits by examining four projects spread as widely as possible across the DESC service territory.[85]

DESC Witness Raftery's rebuttal testimony responded to Witness Stenclik's testimony that DESC had not properly considered the availability of existing and new demand response resources in its analysis of avoided costs. Witness Raftery asserted that the Company has conducted an extensive investigation into the possibility of relying on

[82] Tr. Vol. 1, p. 300.11, ll. 16-21.
[83] Tr. Vol. 1, p. 300.14, ll. 1-20.
[84] Tr. Vol. 1, p. 300.15, l. 11 – p. 30.16, l. 4.
[85] Tr. Vol. 1, p. 300.16, l. 20 – p. 300.17, l. 6.

additional demand response programs to reduce peak demand.[86] Witness Raftery testified that this study and analysis determined that absent sufficient saturation of an Advanced Metering Infrastructure ("AMI") on DESC's system, no demand response programs would be cost effective over the five-year planning timescale used for program planning.[87] Witness Raftery also testified that this study determined that there are no new cost-effective programs that the Company can add that will assist to mitigate the winter peak.[88]

At the hearing, Witness Raftery acknowledged that the Commission's Order 2018-322 in Docket Number 2018-2-E required the Company to aggressively pursue economic demand side management and energy efficiency programs with an emphasis on decreasing the newly developed winter peak.[89] Witness Raftery testified the Company's proposal to add zero new demand response within the five-year program period constituted an aggressive pursuit of economic demand-side programs that the Commission ordered.[90] The Company has failed aggressively pursue demand side programs aimed at winter peaks even though Company Witness Lynch admitted at the hearing that would be feasible to meet winter capacity needs with one resource and summer capacity needs with another (belying the Company's position that solar power provides *no* capacity value because it produces little electricity during early winter morning peaks).[91] For example, solar power could meet summer capacity needs while demand side management and energy efficiency programs could meet winter capacity

[86] Tr. Vol. 1, p. 52.3, ll. 16-21.
[87] Tr. Vol. 1, p. 52.3, l. 21 – p. 52.4, l. 2.
[88] Tr. Vol. 1, p. 52.4, ll. 2-4.
[89] Tr. Vol. 1, p. 108, ll. 1-8.
[90] Tr. Vol. 1, p. 113, ll. 12-21.
[91] Tr. Vol.1, p. 377, ll. 7-23.

needs. Company Witness Neely further admitted that they still do not optimize their capacity expansion plans, despite this being an issue in previous avoided cost proceedings.[92]

6. SBA Surrebuttal Testimony

In his surrebuttal testimony, SBA Witness Burgess responded to DESC Witness Tanner's claim that the *Study* appropriately modeled DESC as an island because the exchanges the Company has with surrounding utilities are solely economic in nature.[93] Witness Burgess explained that DESC appeared to be conflating long-term capacity planning with reliability and near-term operations for managing variable load and resources. He pointed out that power flows between neighboring utilities to manage variability on an operational time horizon is both common and distinct from the long-term planning and procurement of resources each utility undertakes to ensure sufficient resources on its system.[94] Witness Burgess concluded that it is entirely appropriate to assume some level of interaction on an operational time horizon and that doing so does not undermine the Company's self-sufficiency.[95] Witness Burgess also responded to Witness Tanner's claim that modeling four solar projects across the state accurately captured geographic diversity benefits, explaining that modeling just four projects is not sufficient. He also recommended that DESC test the assumption that geographic diversity had been accurately captured by simulating additional locations within DESC's service territory.[96] In addition, Witness Burgess responded to Witness Tanner's testimony that other jurisdictions had increased flexible reserves in order to integrate

[92] Tr. Vol. 1, p. 390, l. 9 – p. 391, l. 21.
[93] Tr. Vol. 2, p. 527.12.
[94] *Id.*
[95] *Id.*
[96] Tr. Vol. 2, p. 527.13.

renewable resources, and questioned the relevance of Witness Tanner's statements since DESC's analysis did not appear to focus on what flexible ramping requirements DESC might have, and instead focused on regulation and load following reserve necessary to address solar drops.[97] Witness Burgess also explained that due to a lack of transparency in DESC's avoided cost methodologies, SBA could not recalculate avoided cost rates using the same methodologies as DESC, and that the most reasonable way forward would be for the Commission to direct the Company to address the flaws identified by intervenors and recalculate its rate.[98] In alternative, Witness Burgess provided an alternative set of avoided cost rates based on SBA's reasonable estimate of what would be required to correct DESC's methodological flaws.[99]

7. SACE and CCL Surrebuttal Testimony

In his surrebuttal testimony, Witness Stenclik responded to DESC Witnesses Bell and Hanzlik's characterization of his direct testimony as advocating for operation of a system without any operating reserves.[100] Witness Stenclik explained that his testimony did not advocate for an abandonment of all operating reserves, and stated that while there may be a need for operating reserves to integrate wind and solar, there are significant monetary and environmental costs associated with overly conservative reserve requirements and requirements based on imprecise assumptions like the ones proposed by DESC.[101] Witness Stenclik further explained that overly stringent reserve requirements

[97] Tr. Vol. 2, p. 527.14.
[98] Tr. Vol. 2, p. 527.15.
[99] *Id.*
[100] Tr. Vol. 2, p. 640.2, ll. 21-22.
[101] Tr. Vol. 2, p. 640.2, l. 22 – p. 640.3, l. 5.

burden ratepayers, lead to unnecessary operating costs, and limit the growth of the solar industry with only marginal or no benefits to overall reliability.[102]

Witness Stenclik explained that contrary to Witness Hanzlik's testimony, his direct testimony did not advocate that DESC shift risk to neighboring utilities, "ride the lines" of the Eastern Interconnect, or ignore the importance of NERC Standards. Instead, Witness Stenclik explained, his testimony correctly identified allowable operations within the NERC standards and the benefits of a large interconnected grid. Witness Stenclik explained that: (1) DESC is not an electrical island, and modeling the DESC grid in isolation, as the *Cost of Variable Integration Study* does, misrepresented this reality, removes a highly economic form of system flexibility, and ignores an important mitigation measure for solar integration implemented by other utilities around the world for years; (2) NERC standards recognize that perfect balancing of interchange with neighboring balancing authorities ("BAs") is neither possible, expected, or necessary, and the *Study's* assumption that DESC must immediately cover 99% of all solar forecast errors, and do so locally, is simply not true; (3) neighboring balancing areas are an asset, and through coordination, solar variability and uncertainty can be spread over large areas and multiple balancing areas, and a large pool of reserve assets become available; and (4) a grid outage event caused by solar forecast error is extremely unlikely, and DESC's analysis and testimony overstates the threat to reliability wen solar is added to the grid.[103]

Witness Stenclik also responded to DESC Witness Tanner's testimony that Navigant had properly analyzed solar data because it relied on NREL data sets. Witness Stenclik explained that while Witness Tanner utilized an accepted data set provided by

[102] Tr. Vol. 2, p. 640.3, ll. 7-9.
[103] Tr. Vol 2, p. 640.3, l. 16 – p. 640.6, l. 15.

NREL, he analyzed that data using overly conservative assumptions.[104] For example, the *Cost of Variable Integration Study* assumed that 99% of all solar drops had to be covered by operating reserves, while other studies, including the NREL studies that utilized the aforementioned data sets, used a 95% confidence interval.[105] Witness Stenclik further explained that while this may seem like a small difference, the outlier data located at the 98th to 99th percentiles drives much of the *Study's* overall reserve requirements.

Witness Stenclik also addressed Witness Tanner's claim that the *Study* properly evaluated geographic diversity benefits. Witness Stenclik explained that the *Study* evaluated geographic diversity of the 4-hour-ahead solar forecast across only four sites in the DESC service territory, when in reality solar will be developed across dozens of sites and thousands of rooftops subject to more variability.[106] This analysis did not adequately represent the locational heterogeneity of DESC's system and resulted in estimated integration costs being too high.[107]

Witness Stenclik also responded to Witness Tanner's argument that the *Study* appropriately allowed combined cycle gas units to provide reserves only when they are operating, and therefore accurately modeled the units' capability to provide reserves within the four-hour forecast. Witness Stenclik explain that Witness Tanner's statement actually supported his critiques of the *Study*, because DESC's own data request responses showed that a *combined cycle unit can start within two hours*, meaning that a shorter forecast is necessary in order to adequately model the unit's value.[108] Witness Stenclik further explained that ideally the *Study* should use shorter forecast horizons, which would

[104] Tr. Vol. 2, p. 640.6, ll. 21-23.
[105] Tr. Vol.2, p. 640.6, l. 23 – p. 640.7, l. 6.
[106] Tr. Vol. 2, p. 640.7, ll. 10-13.
[107] Tr. Vol. 2, p. 640.7, ll. 13-19.
[108] Tr. Vol. 2, p. 640.8, ll. 3-6.

significantly reduce the reserve requirements and associated costs; however, even if the forecast horizon is limited by low-resolution data, then combined cycle units should be counted as providing reserves even when offline to accurately quantify the costs of providing reserves and maintaining reliability.[109]

Witness Stenclik also responded to Witness Tanner's assertion that because of the amount of capacity available at night, the *Study's* assumption that additional reserves are required during every hour of the year, including at night, "does not materially change system economics." Witness Stenclik explained that Witness Tanner's claim was highly misleading and could not be quantified or verified.[110] Furthermore, Witness Stenclik pointed out that Witness Tanner's direct testimony included a figure that illustrated many reserve shortfall events after 6pm and before 9 am—times when additional reserves *were* required but solar output was zero or low.[111] This is especially problematic in the winter, when challenged operations occur during the early morning load ramp and evening peak, when solar output is predictably low (and thus the magnitude of solar supply risk is predictably low).[112] As Witness Stenclik explained, by positing that these hours require the same quantum of reserves as mid-day hours (when solar supply risk is highest), the *Study* improperly added cost to the system and unfairly attributed that cost to solar generators.[113]

Witness Stenclik also responded to Witness Tanner and Witness Bell's claim that the *Study* correctly evaluated other technologies and operating practices to reserves. Witness Stenclik explained that the *Study's* evaluation of other technologies and options

[109] Tr. Vol. 2, p. 640.8, ll. 6-12.
[110] Tr. Vol. 2, p. 640.8, ll. 19-21.
[111] Tr. Vol. 2, p. 640.8, l. 21 – p. 640.9, l. 4.
[112] Tr. Vol. 2, p. 640.9, ll. 4-6.
[113] Tr. Vol. 2, p. 640.9, ll. 7-9.

was overly simplified and inaccurate.[114] Specifically, the *Study* did not consider or quantify the various benefits associated with adding battery storage and failed to consider larger balancing area coordination, on grounds that such coordination is infeasible in the short term despite the study horizon extending over 14 years.[115] Furthermore, Witness Stenclik pointed out, the *Study* altogether failed to evaluate other potential technologies and operating strategies including new targeted demand response, combined cycle upgrades, and discounting of solar forecasts.[116]

Witness Stenclik also responded to Witness Tanner's claim that Witness Stenclik had conflated regulation reserves and operating reserves, and that other grid operators have required large increases in reserve requirements with additional solar. Witness Stenclik explained that he had not conflated different reserve types, and that his direct testimony used an example of regulation reserves because the *Study* repeatedly discusses the need to manage solar variability, which is managed by regulation reserves, and forecast errors, which are managed by operating reserves.[117] To further bolster his assertion that grid operators in other jurisdictions have not required large increases in reserve requirements with additional solar, Witness Stenclik introduced a figure showing ERCOT's non-spinning reserve requirements, which are used to manage solar forecast and errors.[118] The figure showed that in ERCOT, the non-spinning reserve requirement has remained flat despite significantly increasing wind and solar resource capacity.

Witness Stenclik also responded to DESC Witness Bell's testimony that DESC's actual operating practice required additional reserves for solar intermittency. Witness

[114] Tr. Vol. 2, p. 640.9, ll. 21-22.
[115] Tr. Vol. 2, p. 640.9, l. 22 – p. 640.10, l. 17.
[116] Tr. Vol. 2, p. 640.10, ll. 18-20; Tr. Vol. 2, p. 640.14, ll. 10-21.
[117] Tr. Vol. 2, p. 640.11, ll. 3-6.
[118] Tr. Vol. 2, p. 640.11, l. 6 – p. 640.12, l. 13.

Stenclik pointed out that Witness Bell's testimony that current operating practices include reserves to cover 40% of solar output is the first time DESC has made this information public, and appear to be a very recent development.[119] Witness Stenclik explained that this very recent imposition of increased reserve requirements underscores the need for additional study and operation experience prior to imposing a VIC.[120]

Witness Stenclik also responded to DESC Witness Hanzlik's rebuttal testimony. Witness Stenclik explained that Witness Hanzlik's testimony that sudden spikes in solar generation greatly impact system frequency was misleading and unsupported.[121] This is because system frequency is supported by inertia and automatic response from thousands of generating units across the Eastern Interconnect. Therefore, Witness Stenclik explained, a change in solar output in South Carolina, even at the highest levels evaluated in this study, appears very small given the size of the rest of the Eastern Interconnect, and would have little impact on the system frequency.[122] Witness Stenclik concluded that while the concern Witness Hanzlik articulated might be prudent for low inertia grids like ERCOT or island systems, it is not a concern for the Eastern Interconnect for the foreseeable future.[123]

Witness Stenclik explained that the importance of an hourly reserve requirement for solar forecast errors is underscored by DESC Witness Hanzlik's testimony that during early morning hours "solar is not available and DESC's non-solar generators are near maximum generation output levels while reserves are at the lowest level for the day."[124]

[119] Tr. Vol. 2, p. 640.12, ll. 4-6.
[120] Tr. Vol. 2, p. 640.13, ll. 9-11.
[121] Tr. Vol. 2, p. 640. 15, ll. 3-5; 11-12.
[122] Tr. Vol. 2, p. 640.15, ll. 5-12.
[123] Tr. Vol. 2, p. 640. 15, ll. 12-14.
[124] Tr. Vol. 2, p. 640.15, ll. 21-23.

A high solar scenario should not add any solar reserves during these challenging hours because it is known with perfect accuracy that there will be no solar generation before sunrise.[125]

Witness Stenclik also responded to Witness Hanzlik's testimony regarding the Fairfield Pumped Storage Plant. Witness Stenclik explained that Witness Hanzlik had misunderstood his direct testimony, and that Witness Stenclik's testimony was not based on DESC's actual operating practices, but solely on the manner in which the *Study* modeled the Fairfield Plant.[126]

Witness Stenclik also responded to DESC Witness Neely's rebuttal testimony, which asserted that any delay in including the cost of operating reserves harms DESC's customers. Witness Stenclik disagreed with this statement, explaining that using the values developed by the *Study* would add long-term, incorrectly-calculated contractual costs to solar project, which would increase the price of solar power in South Carolina on a false basis, and therefore deny ratepayers the economic benefit of renewable energy that is actually cost-effective.[127] Witness Stenclik further explained that ultimately the VIC costs would be incurred by the ratepayer due to more expensive solar generation and continued use of DESC's fossil generating fleet.[128]

Finally, Witness Stenclik responded to DESC Witness Raftery's testimony that DESC had appropriately included demand response resources in its VIC analysis. While Witness Raftery stated that Witness Stenclik had incorrectly asserted that DESC has not evaluated demand response in general, Witness Stenclik explained that his direct

[125] Tr. Vol. 2, p. 640.15, l. 23 – p. 640.16, l. 2.
[126] Tr. Vol. 2, p. 640.16, ll. 17-23.
[127] Tr. Vol. 2, p. 640. 17, ll. 18-23.
[128] Tr. Vol. 2, p. 640.17, l. 23 – p. 640.18, l. 2.

testimony correctly stated that demand response was not included as a new reserve option in the *Study*.[129]

8. ORS Surrebuttal Testimony

ORS Witness Horii responded to DESC Witnesses' testimony regarding the Company's proposed VIC. First, Witness Horii explained that he disagreed with DESC Witness Neely's assertion that maintaining an additional 35% of installed solar capacity to accommodate the integration of solar resources based on 1-hours drops is better than using 15-minute drops.[130] Witness Horii explained that based on DESC's analysis of solar drops over 15-minute periods, DESC would only need to carry 13-18% of solar capacity for additional operating reserves.[131] This would allow DESC to add to reserves as needed, rather than carrying an additional 35% of installed solar capacity as additional operating reserves at all hours when solar generates.[132]

Witness Horii also responded to Witness Bell and other DESC Witnesses that characterized a four hour period during which solar can drop by 62% of installed capacity as "an important gauge of reliability risk," explaining that the 62% drop is irrelevant for determining the amount of additional operating reserves for two reasons. First, the 4-hour period is inconsistent with the intended purpose of operating reserves, which are carried to address short-term changes in demand or generation, while longer-term changes, such as those over four hours, can be addressed with options that are less costly, such as generation unit rescheduling and the starting of off-line resources.[133] Second, while the Company characterized the drop as "unpredicted," DESC's data responses to

[129] Tr. Vol. 2, p. 640.18, ll. 13-21.
[130] Tr. Vol. 2, p. 697.2, ll. 18-23.
[131] Tr. Vol. 2, p. 697.2, l. 23 – p. 697.3, l. 1.
[132] Tr. Vol. 2, p. 697.3, ll. 2-6.
[133] Tr. Vol. 2, p. 697.3, ll. 13-16.

ORS provided no data to support the drop as being the difference between *expected* and actual output; instead, the data indicated that the drop was simply a change in actual solar generation.[134] If most of that solar reduction had been predicted, for example through day ahead forecasts based on expected weather patterns, there would be a much smaller "unpredicted" drop requiring additional operating reserves. Therefore, Witness Horii concluded, DESC's estimates of the risk of unexpected solar drops are overstated.[135]

Witness Horii also critiqued the Company's reliance on amended operating reserve costs. Witness Horii stated that "the high magnitude of the operating reserve costs, both in absolute and relative terms compared to the Company's original direct testimony, immediately draws into question the appropriateness of DESC's assumptions, such as additional operating reserves equal to 35% of installed solar capacity."[136] Witness Horii also expressed concern that the large change in estimated additional costs for solar integration between DESC's direct and amended direct testimonies "raised questions" as to whether the Company's production simulation modeling of avoided energy costs accurately quantified the impact of solar integration.[137] Witness Horii concluded that DESC had failed to provide sufficient support to justify the adoption of the avoided energy rates that include the Company's amended estimation of the costs of the additional operating reserves, and recommended that the Commission reject the amended proposed avoided energy rates.[138] Instead, Witness Horii recommended that the Commission approve the avoided energy rates that reflect DESC's estimated solar

[134] Tr. Vol. 2, p. 697.3, l. 17 – p. 697.4, l. 2.
[135] Tr. Vol. 2, p. 697.4, ll. 1-2.
[136] Tr. Vol. 2, p. 697.4, ll. 7-15.
[137] Tr. Vol. 2, p. 697.4, ll. 11-14.
[138] Tr. Vol. 2, p. 697.4, ll. 15-21.

avoided energy costs without additional operating reserves, but include the recommended adjusted VIC from his direct testimony:[139]

Table 1: Rate PR-1 Avoided Energy Rates for Solar QFs ($/kWh)

Time Period	DESC Amended Proposed	E3 Proposed
May 2019-April 2020	.02763	.03114

Table 2: Rate PR-Standard Offer Avoided Energy Rates for Solar QFs ($/kWh)

Time Period	DESC Amended Proposed	E3 Proposed
2020-2024	.01676	.02112
2025-2029	.01566	.02375

[140]

9. Independent Consultant Report

The Commission's independent third party consultant, Power Advisory, prepared a report reviewing various aspects of DESC's proposals. Power Advisory noted that the effect of DESC's proposed Embedded Integration Charge would be to decrease the Company's avoided costs by almost 30% in 2020-2024, and by 40% in 2025-2029.[141] Power Advisory concluded that "DESC's proposed values for the VIC, and solar integration costs embedded in its proposed avoided costs, are not adequately supported by the evidence[.]"[142] Power Advisory recommended that lower solar integration costs

[139] Tr. Vol. 2, p. 697.6, ll. 16-19.
[140] Tr. Vol. 2, p. 697.7, ll. 10-16.
[141] *Id.* at p. 6.
[142] Docket 2019-184-E Independent Consultant Final Report at p. iii.

be employed, and that as provided for in Act 62, the Commission initiate a study with an independent consultant to asses DESC's solar integration costs.[143]

Power Advisory explained that it considers the most significant issues with the VIC and EIC methodologies to be: (1) inappropriate choice of data to analyze solar intermittency; (2) lack of support for the risk threshold used to determine additional reserve requirements; (3) inappropriate modeling of the additional reserve requirements; and (4) inadequate consideration of alternative sources of reserve capacity.[144]

First, Power Advisory found that "neither DESC's nor Navigant's analyses of solar intermittency provide good bases for estimating the quantity of additional reserves that will be required, likely resulting in significant overestimation of the amount of additional reserves required and the associated costs."[145] Power Advisory explained that DESC's analysis quantifying the EIC was "based on the changes in solar generation from one time interval to another, rather than on differences between forecast and actual solar generation for the same interval. Since the purpose of reserves is to address unexpected changes in supply and demand, DESC's analysis is simply not relevant."[146] With respect to the Navigant Study, Power Advisory found that the analysis "was based on a comparison between forecast and actual solar generation, but their exclusive reliance on four-hour-ahead forecasts is overly simplistic and fails to conform with best practice."[147] Power Advisory also found that using a four-hour-ahead forecast is "overly conservative

[143] *Id.*
[144] *Id.* at p. 8.
[145] *Id.* at p. 12.
[146] *Id.*
[147] *Id.*

and contributes to a need for higher reserves than would be required under and appropriate application of best practices."[148]

Second, Power Advisory determined that none of the three standards used by DESC to determine the additional reserves attributable to solar generation—35% of nameplate capacity for the avoided cost calculations, up to 32% of installed capacity for the VIC calculations, and DESC System Control's 40% of forecast generation—have been "adequately justified as a reasonable balance between costs and risks."[149] Power Advisory further concluded that "greater analytical rigor is required than DESC has employed to ensure a reasonable trade-off between reserve costs and risk."[150]

Third, Power Advisory determined that DESC and Navigant both inappropriately maintained high reserve levels even when solar generation was modeled to be low, and that this likely contributed to over-estimation of the cost of maintaining additional reserves because many of the hours when reserves are low occur in early morning when there is little or no solar generation.[151]

Fourth, Power Advisory determined that DESC and Navigant both failed to adequately evaluate alternative means of ensuring adequate reserves. Power Advisory concluded that "it is impossible to determine, based on the evidence submitted, whether combustion turbines or batteries would be cost-effective if other value streams were considered; if demand response targeted at providing flexible reserves appropriate for solar integration would be cost effective; or how likely it is that some kind of reserve

[148] *Id.*
[149] *Id.* at p. 15.
[150] *Id.*
[151] *Id.* at p. 19.

sharing for solar integration will occur at some point over the period for which these rates apply."[152]

Power Advisory expressed support for SACE and CCL Witness Stenclik's recommendation that a cost study be undertaken as part of the independent study recommended in Act 62 to evaluate the integration of renewable energy and emerging energy technologies into the electric grid.[153] However, Power Advisory was "reluctant to recommend that there be no solar integration charge."[154] Power Advisory agreed with ORS Witness Horii's approach to developing a reasonable interim estimate of solar integration costs, using it as the VIC, and also using it to adjust the avoided cost-based rates.[155] Power Advisory declined to support the specific calculations that Witness Horii used to arrive at $2.29/MWh, "because it is based on Navigant's analysis, which is flawed in several ways, only one of which Mr. Horii attempts to correct."[156] Power Advisory recommended that as an interim measure, until such time as the integration study contemplated by Act 62 be completed and the results be implemented, Witness Horii's estimate of $2.29/MWh be used as the VIC and EIC.[157]

[152] *Id.* at pp. 21-22.
[153] *Id.* at pp. 22-23.
[154] *Id.* at p. 23.
[155] *Id.*
[156] *Id.* at p. 24.
[157] *Id.* at p. 25.

10. Commission Conclusions

The Commission concludes that the Company's proposals to impose (1) the Variable Integration Charge quantified by Navigant on existing solar QFs and (2) an Embedded Integration Charge in the proposed avoided cost rates for future solar QFS are unreasonable for several reasons. The Commission finds persuasive the testimony of SACE and CCL Witness Stenclik, SBA Witness Burgess, and ORS Witness Horii. All three witnesses provided compelling testimony that DESC and Navigant's analysis: (1) used inappropriate choice of data to analyze solar intermittency; (2) used unsupported risk thresholds to determine additional reserve requirements; (3) inappropriately modeled additional reserve requirements; and (4) failed to adequately consider alternative sources of reserve capacity. The Commission finds compelling Witness Horii's testimony explaining that DESC's reliance upon data measuring changes in solar output over time, rather than the difference between forecasted solar output and actual solar output over time analyzes solar volatility rather than solar forecast risks.

The Commission also finds persuasive Witness Stenclik and Witness Burgess's testimony regarding Navigant's failure to model DESC as it actually operates as part of the Eastern Interconnect, and failure to properly quantify geographic diversity benefits of solar.

The Commission agrees with Power Advisory's conclusion that "DESC's proposed values for the VIC, and solar integration costs embedded in its proposed avoided costs, are not adequately supported by the evidence[.]"[158] Therefore the Commission will reject the Company's proposed VIC and EIC and direct DESC to recalculate its avoided cost rates without the EIC.

[158] Docket 2019-184-E Independent Consultant Final Report at p. iii.

The Commission finds compelling the recommendation made by Witness Stenclik Witness Burgess, and Power Advisory that the proposed VIC and EIC are premature pending the independent integration study authorized by the South Carolina Legislature. The Commission agrees with Witness Stenclik's testimony that the integration study should be developed through a process that includes stakeholders and independent technical experts. Therefore, the Commission will reject the Company's proposed VIC and EIC in anticipation of a forthcoming integration study process involving independent and stakeholder review and input as contemplated by Act 62, S.C. Code Ann. § 58-37-60(A).

The Commission acknowledges that while Witnesses Stenclik and Burgess recommend that the VIC be rejected outright, Witness Horii has put forth an alternative reduced VIC of $2.29/MWh. The Commission finds compelling Power Advisory's finding that Witness Horii's alternative only partially corrects Navigant's analysis, "which is flawed in several ways, only one of which Mr. Horii attempts to correct."[159] The Commission therefore concludes that although Mr. Horii's alternative is more reasonable than the Company's proposed VIC, even this reduced VIC lacks sufficient evidentiary support. The Commission will therefore direct the Company to remove the proposed VIC from the standard offer and recalculate its avoided costs without the EIC. This conclusion does not preclude the Company from proposing and seeking to justify integration charges on a prospective basis for PPAs signed pursuant to subsequent avoided cost proceedings following completion of the Act 62 integration study.

The Commission further finds that DESC has failed to fully implement Commission Order 2018-322 in Docket Number 2018-2-E requiring the Company to

[159] *Id.* at 24.

aggressively pursue economic demand-side management and energy efficiency programs with an emphasis on decreasing the newly developed winter peak. The Commission will again require DESC to follow this directive beginning in 2020. The Commission further finds this action warranted in light of the fact that the Company admitted at the hearing that different resources can provide capacity for different season peaks. For example, solar power could meet summer capacity needs while demand side management could meet rare winter peaks. This finding also supports a non-zero capacity value for solar QFs that can meet the summer needs. Finally, the Company admitted it does not currently optimize its resource plan despite using the difference in revenue recovery method for calculating avoided costs. In accordance with FERC Order 69 implementing PURPA and Act 62 requiring compliance with FERC Orders, the Company should optimize its resource planning.

V. FINDINGS OF FACT

1. The methodology and assumptions employed by Navigant's *Cost of Variable Integration Study* and DESC's avoided cost calculations in support of the Company's proposed VIC and EIC are fundamentally flawed.

2. The Navigant *Study's* reliance on a four-hour-ahead forecast is inconsistent with the timeframe under which reserves would actually be dispatched, and is therefore an inappropriate data source for analyzing solar intermittency risks.

3. DESC's reliance upon data measuring changes in solar output over time, rather than the difference between forecasted solar output and actual solar output over time is an inappropriate data source for analyzing solar forecast risks. Absolute changes in solar output over time measure solar intermittency rather than solar forecast risks.

4. The Navigant *Study* and DESC's avoided cost calculations rely on risk thresholds that have not been justified by the Company, and therefore lack evidentiary support.

5. The Navigant *Study* failed to accurately model additional reserve requirements associated with increased solar generation. DESC has failed to provide evidence that the *Study's* addition of reserves during hours when the system is stressed and solar generation is low or not occurring does not inappropriately inflate the proposed VIC.

6. DESC's avoided cost calculations modeled additional required reserves in a way that substantially deviates from DESC's actual practices.

7. The methodological flaws in the *Cost of Variable Integration Study* and DESC's avoided energy cost calculations result in the Company's proposed VIC and EIC substantially over-estimating the costs of variable integration on the DESC system.

8. For the purpose of determining whether an alternative source of reserve requirements is cost-effective, the Company should consider all of the alternative source's quantifiable benefits, including firm capacity benefits, energy or energy arbitrage benefits, transmission and distribution deferral, and environmental benefits. Neither the Navigant *Study* nor DESC's avoided cost calculation adequately considered alternative sources of reserve requirements.

9. The DESC system operates as part of the Eastern Interconnect. The Navigant *Study* fails to accurately model the reliability benefits associated with DESC's connection to the Eastern Interconnection.

10. As DESC's solar fleet increases, aggregation and geographic diversity benefits will significantly mitigate short-term forecast errors and short-term solar output volatility. The Navigant *Study* fails to adequately model the impact diversity benefits will have on required operating reserves and associated costs.

11. ORS Witness Horii's alternative VIC calculation of $2.39/MWh only corrects for one of the many flaws in the Navigant *Study*, and therefore does not fully or fairly account for costs avoided by the electrical utility or incurred by the electrical utility, including avoided or incurred ancillary services costs as required by Act 62 and consistent with PURPA.DESC has failed to fully implement Commission Order 2018-322 in Docket Number 2018-2-E requiring the Company to aggressively pursue economic demand side management and energy efficiency programs with an emphasis on decreasing its newly developed winter peak.

12. Different resources can provide capacity for different season peaks. For example, solar power could meet summer capacity needs while demand side management could meet rare winter peaks.

13. The Company has not optimized its resource planning.

VI. CONCLUSIONS OF LAW

After hearing the evidence and testimony of the witnesses, the Commission finds and concludes that DESC's proposals pursuant to PURPA Section 210 and § 58-41-20 are not reasonable or prudent as proposed, given the evidence introduced by CCL and SACE, SBA, and ORS. DESC's application to the Commission for approval of the Company's standard offer avoided cost methodologies, form contract power purchase agreements, and commitment to sell forms may be approved as reasonable and prudent if subject to certain conditions.

IT IS THEREFORE ORDERED THAT:

1. The following are not approved as proposed by the Company, and are subject to conditions in Ordering paragraphs below:

    a. The Company's Schedule PP and Standard Offer tariffs.

2. The Company shall revise its Avoided Cost methodology and calculations pursuant to the EFA and PURPA and the following ordering paragraphs, and shall file within 90 days of this order revised tariffs with rates reflecting such changes.

3. For their Avoided Energy Cost Calculations, the Company shall:

    a. Recalculate avoided energy costs so that they do not include an EIC for solar projects.

4. For fully executed PPAs with VIC clauses, the Company shall not impose a VIC upon contracted facilities at this time.

5. Any future integration charges approved by this Commission shall apply on a prospective basis for PPAs signed pursuant to future avoided cost orders by this Commission.

6. DESC is disallowed from recovering any proposed integration costs from ratepayers, customers, or QFs until such time as the Commission finds that DESC has met the requirements of S.C. Code Ann. Section 58-27-865(f) by giving "due regard" to "minimization of the total cost of providing service," including taking efforts to minimize variable energy integration costs.

7. DESC shall identify and implement cost-effective demand side management programs that address and lower winter peak demand beginning in year 2020.

8. DESC shall optimize its resource planning beginning in year 2020.

Respectfully submitted this 12th day of November, 2019.

/s/ Lauren J. Bowen
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